WHAT IS CLAIMED IS:

1. Apparatus for measuring deflection of a film in a film gate having an aperture illuminated by a primary light source having an output spectrum, comprising:

a) a reflective photonic probe mounted in the film gate, the reflective probe having at least one optical fiber;

b) a measurement light source coupled to reflective photonic probe and emitting a wavelength of light outside of the primary light source's spectrum;

c) a photodetector coupled to the reflective photonic probe;

d) a narrow pass optical filter located between the photodetector and the reflective photonic probe, the narrow pass filter passing the light from the measurement light source and blocking the light from the primary light source; and

e) signal processing electronics connected to the photodetector for producing a signal representing the motion of the film perpendicular to the plane of the film.

2. The apparatus claimed in claim 1, wherein the reflective photonic probe is mounted on a translation stage.

3. The apparatus claimed in claim 1, wherein the reflective photonic probe is a reflectivity compensated probe having first and second detection optical fibers.

4. The apparatus claimed in claim 1, wherein the translation stage is an X,Y,Z translation stage and the signal processing electronics includes means for performing a calibration using the Z translation of the translation stage.

5. The apparatus claimed in claim 3, wherein the translation stage is an X,Y,Z translation stage and the signal processing electronics includes means for performing a calibration using the Z translation of the translation stage and

means for determining the ratio of the signals collected by the first and second detection optical fibers.

6. The apparatus claimed in claim 1, wherein the film gate is in a projector that includes a shutter and wherein the apparatus includes means for producing a signal representing the shutter motion.

7. The apparatus claimed in claim 1, wherein the film gate is in a film scanner and the primary light source is a laser.

8. The apparatus claimed in claim 1, wherein the film gate is a recording gate of a film recorder.

9. The apparatus claimed in claim 6, wherein the signal processing includes means responsive to the signal representing shutter motion for separating the signal representing the motion of the film into thermal and mechanical components.

10. The apparatus claimed in claim 6, further comprising a high speed video camera for simultaneously capturing real and reflected images of the reflective photonic probe, whereby the motion image of the film can be correlated to the signal representing the motion of the film.

11. The apparatus claimed in claim 7, further comprising a high speed video camera for simultaneously capturing real and reflected images of the reflective photonic probe, whereby the motion image of the film can be correlated to the signal representing the motion of the film.

12. The apparatus claimed in claim 8, further comprising a high speed video camera for simultaneously capturing real and reflected images of the reflective photonic probe, whereby the motion image of the film can be correlated to the signal representing the motion of the film.

13. The apparatus claimed in claim 1, further comprising means for measuring the flux density of the light from the primary light source over the area of the film gate and means in the signal processing electronics for correlating the measured flux density with the signal representing motion of the film.

14. The apparatus claimed in claim 1, further comprising a notch filter located between the light source and the film gate for filtering out light of the measurement light source wavelength.

15. A method of measuring the deflection of a film in a film gate having an aperture illuminated by a primary light source having an output spectrum, comprising the steps of:

a) mounting a measurement apparatus in the film gate, the measurement apparatus having:

1) a reflective photonic probe having at least one optical fiber;

2) a measurement light source coupled to reflective photonic probe and emitting a wavelength of light outside of the primary light source's spectrum;

3) a photodetector coupled to the reflective photonic probe;

4) a narrow pass optical filter located between the photodetector and the reflective photonic probe, the narrow pass filter passing the light from the measurement light source and blocking the light from the primary light source; and

5) signal processing electronics connected to the photodetector for producing a signal representing the motion of the film perpendicular to the plane of the film; and

b) measuring the deflection of the film with the measurement apparatus.

16. The method claimed in claim 15, wherein the deflection is measured with the primary light source off to detect deflection due to mechanical motion of the film.

17. The method claimed in claim 15, wherein the deflection is measured with the primary light source on to detect deflection due to thermally induced buckling of the film.

18. The method of claim 16, wherein the film gate is in a projector having a film advance mechanism and a shutter, and further comprising the steps of determining a desired phase relationship between a film advance mechanism and a shutter in the projector from the measurement of the mechanical deflection.

19. The method of claim 16, further comprising the steps of:

a) measuring the magnitude of mechanical deflection of the film in the gate at a plurality of tensions; and

b) determining an optimum tension that produces a minimal deflection.

20. The method of claim 16, further comprising the steps of:

a) performing a fast Fourier transform on the signal to measure the frequency and amplitude of mechanical deflection of the film in the gate;

b) determining from the frequency which component of an apparatus containing the film gate contributed to the deflection; and

c) adjusting a property of the determined component to control the amplitude of the mechanical motion.

21. The method claimed in claim 16, further comprising the steps of:

a) measuring the deflection of the film with the primary light source on to detect combined mechanical deflection and thermally induced buckling; and

b) deriving the thermally induced bucking by subtracting the signal with the light off from the signal with the light on.

22. The method claimed in claim 17, further comprising the steps of:

a) measuring the amplitude of the thermally induced buckling at a plurality of light intensities; and

b) determining a desired light intensity from the measured buckling amplitudes.

23. The method claimed in claim 17, further comprising the step of:

a) measuring the amplitude of the thermally induced buckling; and

b) adjusting a mechanical component of an apparatus containing the film gate to reduce the amplitude.

24. The method claimed in claim 17, further comprising the step of:

a) measuring the flux density distribution at the film gate; and

b) adjusting output of the primary light source to provide a desired flux density distribution at the film gate aperture.

25. The method claimed in claim 15, further comprising the steps of providing a high speed video camera for simultaneously capturing real and reflected images of the reflective photonic probe and correlating the motion image of the film with the signal representing motion of the film.

26. The method claimed in claim 15 wherein the reflective photonic probe is mounted on a translation stage and further comprising the steps of performing a calibration using the translation stage and determining the ratio of the signals collected by the first and second detection optical fibers.